

WHAT IS CLAIMED IS:

1. An exposure method comprising the steps of:  
illuminating a mask that forms a desired  
5 pattern and an auxiliary pattern smaller than the  
desired pattern; and  
projecting light from the mask onto an object  
to be exposed via a projection optical system at a  
position offset from a focus position that provides the  
10 highest resolution so that the auxiliary pattern is not  
resolved.
  
2. An exposure method according to claim 1,  
wherein the desired pattern is a contact-hole pattern.  
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3. An exposure method according to claim 2,  
wherein the mask two-dimensionally arranges the  
contact-hole pattern and the auxiliary pattern like a  
matrix.  
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4. An exposure method according to claim 2,  
wherein said step forms a quadrupole effective light-  
source shape that includes two pairs of light  
transmitting parts, two lines each connecting each pair  
25 of light transmitting parts constituting a coordinate  
for the contact-hole pattern.

5. An exposure method according to claim 2,  
wherein a distance A between the best focus position  
and the defocus position meets the following equation:

$$0 < A \leq k_1 \times (D / S) \times (\lambda / NA^2)$$

5 where D is a hole diameter of the contact-hole pattern,  
S is a hole diameter of the auxiliary pattern, P is a  
half-pitch of the contact-hole pattern and auxiliary  
pattern,  $\lambda$  is a wavelength of exposure light, NA is a  
numerical aperture of the projection optical system,  
10 and  $k_1 = (NA / \lambda) \times P$ .

6. An exposure method according to claim 1,  
wherein said step uses illumination light that includes  
a first component incident perpendicularly upon the  
15 mask, and a second component that is incident obliquely  
upon the mask and has light amount smaller than that of  
the first component.

7. An exposure method according to claim 1,  
20 wherein said step inclines the mask or the object to be  
exposed relative to an optical axis of the projection  
optical system.

8. An exposure method according to claim 1,  
25 wherein a shape of the auxiliary pattern is analogous  
to that of the desired pattern.

9. An exposure method comprising the step of illuminating a mask that forms a desired pattern and an auxiliary pattern smaller than the desired pattern, and projecting the light from the mask onto an object to be  
5 exposed via a projection optical system at positions which are different in defocus amount.

10. An exposure method according to claim 9,  
wherein the desired pattern is a contact-hole pattern.

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11. An exposure method according to claim 10,  
wherein the mask two-dimensionally arranges the contact-hole pattern and the auxiliary pattern like a matrix.

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12. An exposure method according to claim 10,  
wherein said illuminating step forms a quadrupole effective light-source shape that includes two pairs of light transmitting parts, two lines each connecting  
20 each pair of light transmitting parts constituting a coordinate for the contact-hole pattern.

13. An exposure method according to claim 10,  
wherein a distance A between the best focus position  
25 and the defocus position meets the following equation:

$$0 < A \leq k_1 \times (D / S) \times (\lambda / NA^2)$$

where D is a hole diameter of the contact-hole pattern,  
S is a hole diameter of the auxiliary pattern, P is a  
half-pitch of the contact-hole pattern and auxiliary  
pattern,  $\lambda$  is a wavelength of exposure light, NA is a  
5 numerical aperture of the projection optical system,  
and  $k_1 = (NA / \lambda) \times P$ .

14. An exposure method according to claim 9,  
wherein the step uses illumination light that includes  
10 a first component incident perpendicularly upon the  
mask a second component that is incident obliquely upon  
the mask and has light amount smaller than that of the  
first component.

15 15. An exposure method according to claim 9,  
wherein one of the positions is the best focus position.

16. An exposure method according to claim 9,  
wherein said step inclines the mask or the object to be  
20 exposed relative to an optical axis of the projection  
optical system.

17. An exposure method according to claim 9,  
wherein a shape of the auxiliary pattern is analogous  
25 to that of the desired pattern.

18. An exposure apparatus comprising:  
an illumination optical system for  
illuminating a mask that forms a desired pattern and an  
auxiliary pattern smaller than the desired pattern; and  
5 a projection optical system for projecting  
light from the mask onto an object to be exposed,  
wherein said exposure apparatus exposes the  
object at least at a defocus position offset from the  
best focus position.

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19. An exposure apparatus according to claim 18,  
wherein said exposure apparatus exposes the object at  
the defocus position and at the best focus position.

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20. An exposure apparatus according to claim 18,  
further comprising a mechanism for inclining at least  
one of the mask and the object.

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21. An exposure apparatus according to claim 18,  
further comprising:  
a stage for supporting the object; and  
a drive mechanism for driving the object in  
an optical-axis direction of said projection optical  
system,

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wherein a distance A between the best focus  
position and the defocus position, which is driven by  
said drive mechanism meets the following equation:

$$0 < A \leq k_1 \times (D / S) \times (\lambda / NA^2)$$

where D is a hole diameter of the contact-hole pattern,

S is a hole diameter of the auxiliary pattern, P is a half-pitch of the contact-hole pattern and auxiliary

5 pattern,  $\lambda$  is a wavelength of exposure light, NA is a numerical aperture of the projection optical system, and  $k_1 = (NA / \lambda) \times P$ .

22. A device fabricating method comprising the  
10 steps of:

illuminating a mask that forms a desired pattern and an auxiliary pattern smaller than the desired pattern, and projecting the light from the mask onto an object to be exposed via a projection optical system at a defocus position offset from the best focus  
15 position; and

performing a predetermined process for the object that has been exposed.

20 23. A device fabricating method comprising the steps of:

illuminating a mask that forms a desired pattern and an auxiliary pattern smaller than the desired pattern; projecting the light from the mask onto an object to be exposed via a projection optical system at positions which are different in defocus  
25 amount; and

performing a predetermined process for the object that has been exposed.

24. A device fabricating method comprising the  
5 steps of:

exposing an object using an exposure apparatus; and

performing a predetermined process for the object that has been exposed,

10 wherein the exposure apparatus includes:

an illumination optical system for illuminating a mask that forms a desired pattern and an auxiliary pattern smaller than the desired pattern; and a projection optical system for projecting

15 light from the mask onto an object to be exposed,

wherein said exposure apparatus exposes the object at least twice at different positions which are different in defocus amount.